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(54) **Mobile object navigation system**

Mobiles Navigationssystem

Système de navigation d'un objet mobile

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Description

BACKGROUND OF THE INVENTION

[0001]

1. The present invention relates to a mobile navigation system in accordance with the precharacterizing part of claim 1. Such a mobile navigation system is known from JP-A-63,300,399.
2. Description of the Related Art

In recent years, data communication technology has been remarkably advanced. With the advancement, a new navigation system has been developed and proposed. With the assist of this navigation system, mobile objects, such as vehicles, vessels, and aircrafts, when traveling, can check their present positions and travels toward and exactly reach their destined places.

[0002] A GPS (Global Positioning System) has been known as a system to determine the present positions of mobile objects with a high precision. Reference may be had to US Patent No. 4,114,155 and the references cited therein, and to ELECTRONICS, issued by Ohm Ltd., December, 1984.

[0003] A plurality of artificial satellites are used so that at least four satellites may constantly be observed from the earth. Each mobile object carries a GPS receiver which is for receiving and demodulating a microwave carrying a meaningful signal from each satellite. Through the modulation, the receiver detects orbiting data of the satellite that is contained in the received microwave signal having frequency of about 1 to 2 GHz. The present position of each satellite is obtained by applying the detected orbit data to Kepler's equation and solving the equation. A distance from one mobile object on the ground and each satellite can be obtained by measuring a propagation time of the signal transmitted from each satellite. To work out the present position of the mobile object, the simultaneous equations are solved for the present positions of the satellites and the distances between of the mobile object and the respective satellites.

[0004] In a mobile navigation system known from Record of IEEE Plans 188 Position Location and Navigation Symposion, PP 54-60 the GPS receiver, a data base unit storing map data, an image processing unit, and a display unit are all assembled into each navigation apparatus carried on each mobile object.

[0005] The position data of a mobile object derived from the GPS receiver and the map data derived from the map data base unit are composed by the image processing unit. The image processing unit produces composite image data representative of an image in which a position of the mobile object is traced on a map. The display unit receives the image data and visually presents such an image on its display screen.

[0006] Such a mobile object navigation system is advantageous in that so long as the GPS operates, an operator, e.g., a driver, may always recognize the present position of the mobile object per se, but is disadvantageous in that the expensive map data base unit has to be mounted for each mobile object. Especially, when the mobile object travels in a wide area, since a tremendous amount of map data is required, a great volume data base unit has to be equipped for every mobile. Furthermore, since landform and roads change day by day, the map data must be frequently updated to guarantee exact travelings. Also, it is very difficult or impractical to frequently update the data base unit installed in the mobile object.

[0007] The JP-A-63,300,399 discloses a known mobile object navigation system in accordance with the precharacterizing part of claim 1. In this known mobile object navigation system, the mobile object does not have a function of determining the position of the mobile object per se. The mobile object sends an identification signal to the base station. The identification signal does not indicate the mobile object's position, but functions to identify the mobile object. In the base station, the position of the mobile object is determined by receiving the identification signal with three receiver antennas. Accordingly, this prior art system requires the base station having the function of determining the position of the mobile object. Furthermore, the base station has to send the position information to the mobile object, since the position is determined in the base station. Also, this known navigation system requires a large amount of telecommunication equipment. The base station has to be fixed, because it is difficult to move the location of the base station.

[0008] US-A-3,750,166 describes a pilot data system primarily intended for use by aircraft. This navigation system uses a fixed ground station consisting of master station and three slave stations at certain distances from the master station and from one another. The slave stations may be ground stations or earth satellite stations. In operation, the master station interrogates each aircraft via datalinks, each aircraft reports its identification and altitude via its data-link. The master station and each slave station receives a reply. The bearing and distance of each aircraft from the master station is determined by time delay. This data representing the three-dimensional position of each aircraft is fed to a computer and generates synthetic displays for increments of altitude together with map underlays on which the aircraft appear and transmits the resulting displays for pilot use. It is to be noted that also in this known navigation system the mobile object, namely the aircraft does not include means mounted in the aircraft itself for determining its position.

SUMMARY OF THE INVENTION

[0009] It is an object of the present invention to pro-

vide a mobile object navigation system which can provide a simple apparatus installed in each mobile object which is able to readily realize high performances.

[0010] According to the invention the above object is solved by the features specified in claim 1. Each of depending claims 2 to 6 characterizes an advantageous development thereof.

[0011] Advantageously, in the mobile navigation system thus arranged the map data base unit is provided in the key station, and is accessible to a plurality of mobile objects.

[0012] The key station is preferably a radio station at a fixed location.

[0013] Further objects and advantages of the present invention will be apparent from the following description of the preferred embodiments of the invention as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a schematic illustration of an embodiment of a mobile object navigation system according to the present invention;

Fig. 2 which is combined by Figs. 2a and 2b shows electrical configurations of navigation apparatus used in the embodiment of Fig. 1;

Fig. 3 which is combined by Figs. 3a and 3b is a flow chart useful in explaining an operation of the embodiment of Fig. 1;

Figs. 4a and 4b show formats of a composite signal used in the embodiment of Fig. 1;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Fig. 1 schematically illustrates a navigation system in use with vehicles as a preferred embodiment of a mobile object navigation system according to the present invention.

[0016] In the figure, reference numeral 10 designates a vehicle such as an automobile, 20 a key station as a radio station at a fixed location, 30a, 30b, 30c, and 30d GPS artificial satellites.

[0017] A navigation apparatus installed in the vehicle 10 receives microwaves transmitted from the satellites 30a to 30d, and acquired data representative of the present position of the vehicle 10. The vehicle 10 transmits the position data to the key station 20 by using a radio wave in a frequency band of an HF (High Frequency), VHF (Very High Frequency) or UHF (Ultra High Frequency). The key station 20 transmits the map data of an area in connection with the position data as received by using a radio wave of the HF, VHF or UHF. The vehicle 10 receives the map data and displays an image of a map on which the position of the vehicle is traced by using the received map data and the position data.

[0018] Fig. 2 shows an electrical configuration of the navigation apparatus used in the vehicle navigation system of Fig. 1.

[0019] In the figure, reference numeral 100 designates a navigation apparatus installed in the vehicle 10, and 200 a navigation apparatus installed in the key station 20.

[0020] The navigation apparatus 100 is provided with a GPS antenna 101 and a GPS receiver 102 coupled with the antenna 101.

[0021] The receiver 102 generates the position data representing the present position of the vehicle 10 by using the orbit data transmitted from the satellites 30a to 30d (shown in Fig. 1). Details of the GPS receiver 102 is described in U.S. Patent No. 4,114,155 and documents cited therein.

[0022] An identification (ID) signal generator circuit 103 contains a semiconductor ROM (Read Only Memory) storing an ID code identifying the vehicles itself, and a read-out circuit associated with the ROM. The ID code consists of the number of bits that depends on the number of subscribers in this navigation system.

[0023] A signal composition circuit 104 is coupled with the receiver 102 and the ID signal generator 103, and composes the position data and the ID code. The circuit 104 is coupled with a radio transmitter-receiver 105 capable of transmitting a radio wave in any of HF, VHF and UHF bands. The transmitter-receiver 105 is coupled with an antenna 106.

[0024] A signal separation circuit 107, coupled with the transmiter-receiver 105, receives a signal from the circuit 105 and separates it into a map data signal and a ID code signal.

[0025] A comparator 108, coupled with the signal separation circuit 107 and the ID signal generator circuit 103, compares the ID code signal as separated with a signal containing an ID code assigned to the vehicle itself.

[0026] A memory 109, which consists of a RAM (Random Access Memory), for example, is coupled with the GPS receiver 102 stores the position data representing the present position of the vehicle 10, that is derived from the GPS receiver 102.

[0027] An image processing unit 110 is coupled with the signal separation circuit 107, comparator 108, memory 109, a memory 111 for storing map data as a RAM, for example, a display unit 112, and a key switch 113. The image processing unit 110 includes mainly a microcomputer, and composes the map data derived from the key station 20 and the position data representing the present position of the vehicle 10, that is derived from the memory 109, to form composite image data.

[0028] The display unit 112 includes mainly a cathode ray tube, a liquid crystal display, electroluminescent display or a plasma display panel, and visually presents the composite image data.

[0029] Key switches 113 are manually operated when an operator desires to correct an image displayed by the

display unit 112.

[0030] While the ID signal generator circuit 103 is discretely provided in this instance, the ID code signal assigned to the vehicle may be generated in the transmitter-receiver 105 or the image processing unit 110.

[0031] The transmitter-receiver 105 may be any of an automobile telephone, portable telephone, transmitter-receiver of the MCA (Multi Channel Access) type, personal radio transmitter-receiver, and mobile terminal equipment, e.g., a data terminal device in a teleterminal system. Where the transmitter-receiver 105 consists of the mobile terminal equipment, a navigation system with high performances may be realized because of its additional functions.

[0032] The GPS receiver 102 may be substituted by a receiver based on another scheme for determining the present position of the vehicle 10. A receiver adaptable for various types of position determining systems, as disclosed in U.S. Patent No. 4,359,733 or a receiver for a sign-post system. In the sign-post system, a plurality of position signal transmitters are located in a service area, and when a vehicle travels and is near any of those transmitters, the vehicle receives a position signal from the transmitter to determine the present position thereof.

[0033] The navigation apparatus 200 in the key station is provided with an antenna 201, and a radio transmitter-receiver 202, which is operable in HF, VHF or UHF band and is coupled with the antenna 201.

[0034] A signal separation-composition circuit 203 is coupled with a radio transmitter-receiver 202, and receives a signal from the transmitter-receiver 202 and separates it into a position data signal and an ID code signal. The circuit 203 is connected to a memory 204 such as a RAM for storing the ID code, and a map processing unit 205. The separated ID code signal is stored in the memory 204, and the separated position data is applied to the map processing unit 205. The circuit 203 composes the map data derived from the map processing unit 205 and the ID code signal from the memory 204.

[0035] The map processing unit 205 is connected to a map data base unit 206 and a display unit 207 for monitoring signals in the map processing unit 205. The map processing unit 205 includes a microcomputer as a main component. The unit 205 is responsive to the position data from the signal separation-composition circuit 203 to derive necessary map data from the map data base unit 206.

[0036] The map data base unit 206 may be a memory device made up of a CD (Compact Disc) - ROM and its player. Accordingly, the map data stored therein may readily be updated in accordance with changes of landform and roads, and the data base unit 206 may provide the up-to-date map data.

[0037] The display unit 206 includes mainly a cathode ray tube, a liquid crystal display, electroluminescent display or a plasma display panel, and visually presents the composite image data.

[0038] The operation of the vehicle navigation system thus arranged will be described with reference to Fig. 3 showing a flow chart.

[0039] A following sequence of processings are, at first, performed in the navigation apparatus 100 of the vehicle.

[0040] At step S1, the signals transmitted from the satellites 30a to 30d (Fig. 1) are caught by the GPS antenna 101, and the GPS receiver 102 determines the present position of the vehicle which carries this navigation apparatus 100. The GPS receiver 102 produces the position data including the latitude, longitude and height of the vehicle 10 and speed data based on a rate of change of the position data.

[0041] The latitude data is presented as 032 ° 26.67N, for example, and the longitude data, as 118° 29.99W, for example. To express those figures in the binary system, 4 bits are used for each figure, and 2 bits, for each of the latitude and the longitude. Accordingly, a total of bits for expressing the latitude data or the longitude data is (4 bits × 7 figures + 2 bits) × 2 = 60 bits.

[0042] At next step S2, the signal composition circuit 104 composes the determined position data and also the speed data, and into the ID code uniquely assigned to the vehicle. Incidentally, the determined position data and the speed data are stored into the memory 109.

[0043] The composite data signal may be formatted as shown in Fig. 4a in which the ID code is followed by the position data or as shown in Fig. 4b in which the position data is followed by the ID code.

[0044] In case where the ratio transiver-receiver 105 like an automobile telephone has a phone number uniquely assigned, the phone number may be used as the ID code.

[0045] The transiver-receiver 105 transmits the composite data signal through the antenna 106 by carrying it on a radio wave of 800 to 900 MHz (at step S3).

[0046] In the navigation apparatus 200 of the key station, the transmitter-receiver 202 receives the radio wave containing the composite data signal from the vehicle 10, through the antenna 201, and demodulates it (at step S4).

[0047] The signal separation-composition circuit 203 separates the demodulated signal into the position data and the speed signal, and into the ID code. The ID code is stored into the memory 204. The position data (latitude and longitude data) and the speed data are applied to the image processing unit 205 (at step S5).

[0048] Receiving the position data and the ID code, the image processing unit 205 accesses the map data base unit 206 to derive data of a map containing the vehicle position indicated by the position data (at step S6). More specifically, the derived map data is data of a map containing the vehicle position at the center, for example, the map data of a map of 10 km x 10 km containing the present position of the vehicle 10 at the center.

[0049] In this case, the derived map data may be selected such that an area expanding in the forward direc-

tion of the vehicle 10 is larger than the area in the backward direction thereof. The reduced scale of the map may be varied in accordance with the speed data.

[0050] The map data thus obtained is applied to the signal separation-composition circuit 203, which adds the ID code to the map data received (at step S7). Then, it is transmitted from the transmitter-receiver 202 to the vehicle 10 (at step S8).

[0051] In the navigation apparatus of the vehicle 10, the transmitter-receiver 105 receives a radio wave carrying the map data with the ID code from the key station, through the antenna 106, and demodulates the wave (at step S9).

[0052] The signal separation circuit 107 separates the demodulated signal into the map data signal and the ID code signal. The ID code signal is applied to the comparator 108. The comparator 108 compares the ID code data derived from the ID signal generator circuit 103 with the received and separated ID code signal, to check as to whether or not the map data received is directed to the vehicle per se (at step S10).

[0053] If it is directed to this vehicle, the image processing unit 110 stores the received map data into the memory 111 (at step S11).

[0054] The unit 110 composes the position data representing the present position of the vehicle 10 that is derived from the memory 109, and the received map data, thereby to form a composite image data signal (at step S12). The composite image data signal is transferred to the display unit 112 and displayed thereby as visual image (at step S13).

[0055] The position data derived from the GPS receiver generally presents a geometrical position. To superpose the vehicle position ofthe position data on the map of the map data, the position data may be subjected to the coordinate transformation.

[0056] After the next position of the vehicle 10 is determined in the GPS receiver 102 (at step 14), the image processing unit 110 checks whether or not the determined position is within an area of the map data that was previously transmitted from the key station 20 and stored in the memory 111 (at step S15).

[0057] The map data transmitted from the key station 20 to the vehicle 10 contains the map data covering a satisfactorily large area. Accordingly, there is no need for transmitting another image data from the key station to the vehicle, so long as the present vehicle position is within the area. In other words, the map data previously received is continuously available.

[0058] Thus, when the present vehicle position is within the area of the map data previously received, control goes to step S12 where it traces the position on the same map. Only when the vehicle position is outside the map data area, control returns to step S2.

[0059] By manually operating the key switches 113, a map image displayed on the display screen of the display unit 205 may be subjected to an appropriate image processing, such as enlargement, reduction, and rotation.

[0060] In the navigation apparatus 200 of the key station, various types of managements of vehicle service are possible by displaying information in the map processing unit 205 on the display screen of the display unit 207. Further, the present positions of a plurality of vehicles may be concurrently displayed, with different ID codes respectively assigned to those vehicles. The positions of those vehicles may be simultaneously displayed on the display unit 112 of each vehicle.

[0061] If required the key station may be a specific one of those mobile stations or vehicles, not the radio station at a fixed location.

Claims

1. A mobile navigation system comprising: at least one mobile object (10); a key station (20); a communication system adapted to communicate between said at least one mobile object (10) and said key station; means (100) for determining the position of said at least one mobile object; a data base unit (206), mounted in the key station, for storing map data; means (205), mounted in the key station, responsive to the received position data for deriving from the data base unit map data of an area that includes the received position of said at least one mobile object; means (202), mounted in the key station, for transmitting data including the derived map data to said at least one mobile object via the communication system; and means (112), mounted on said at least one mobile object, for displaying a composite image composed of the position data of the mobile object and the map data, in response to the transmitted data from the key station;
characterized in

that said position determining means (100) are mounted on said at least one mobile object (10),

that means (105, 106) are provided, mounted on said at least one mobile object, for transmitting data representative of the determined position to the key station via the communication system,

that means (107, 108, 110) are provided, mounted on said at least one mobile object, for selecting the map data of itself from the information transmitted from the key station and displaying the selected map data on said display means (112), and said means (107, 108, 110) include an image processing means (110) for forming the composite image based on the selected map data and the position data of the mobile object, and

that said image processing means (110) checks upon each position determination of

said position determining means (100) whether or not the determined position is within an area of the map data that was previously transmitted from said key station (20).

2. A mobile navigation system as claimed in claim 1, wherein the system further comprises means (103-108), mounted on the mobile object (10), for composing the position data and an identification code of the mobile object (10) itself; and means, mounted on the mobile object (10), for separating the data transmitted from the key station into the map data and the identification code.

3. A mobile navigation system as claimed in claim 2, wherein the system further comprises means (108), mounted on the mobile object (10), for comparing the identification code separated by said separating means with the identification code of the mobile object (10) itself to check that the transmitted map data is directed to said mobile object (10).

4. A mobile navigation system as claimed in claim 1, wherein the system further comprises means (203) mounted in the key station for separating the position data transmitted from the mobile object and the identification code, and for composing the map data derived from the deriving means and the identification code of the mobile object.

5. A mobile navigation system as claimed in claim 1, wherein said key station (20) is a radio station at a fixed location.

6. A mobile navigation system as claimed in claim 1, wherein said determining means includes a plurality of artificial satellites (30a-30d) and a GPS receiver (102) for generating the position data representative of the position of the mobile object (10), by using orbit data transmitted from the satellites.

Patentansprüche

1. Mobiles Navigationssystem mit: mindestens einem beweglichen Objekt (10); einem Hauptsender (20), einem Kommunikationssystem, das so ausgebildet ist, dass es Kommunikation zwischen mindestens einem beweglichen Objekt (10) und dem Hauptsender ausführt; einer Einrichtung (100) zum Bestimmen der Position des mindestens einen beweglichen Objekts; einer Datenbankeinheit (206), die im Hauptsender untergebracht ist, um Kartendaten abzuspeichern; einer Einrichtung (205), die im Hauptsender angebracht ist und auf die empfangenen Positionsdaten anspricht, um aus der Datenbankeinheit Kartendaten für einen Bereich abzurufen, der die Position des mindestens einen beweglichen Objekts beinhaltet; einer Einrichtung (202), die in der Hauptstation angebracht ist, um Daten einschließlich der abgerufenen Kartendaten über das Kommunikationssystem an das mindestens eine bewegliche Objekt zu übertragen; und einer Einrichtung (112), die im mindestens einen beweglichen Objekt angebracht ist, um auf die vom Hauptsender gesendeten Daten hin ein zusammengesetztes Bild anzuzeigen, das aus den Positionsdaten für das bewegliche Objekt und den Kartendaten zusammengesetzt ist;
dadurch gekennzeichnet, dass

- die Positionsbestimmungseinrichtung (100) an dem mindestens einen beweglichen Objekt (10) angebracht ist;
- eine Einrichtung (105, 106) vorhanden ist, die am mindestens einen beweglichen Objekt angebracht ist, um über das Kommunikationssystem Daten an den Hauptsender zu senden, die für die bestimmte Position repräsentativ sind;
- eine Einrichtung (107, 108, 110) vorhanden ist, die am mindestens einen beweglichen Objekt angebracht ist, um ihre eigenen Kartendaten aus dem vom Hauptsender übertragenen Information auszuwählen und die ausgewählten Kartendaten auf der Anzeigeeinrichtung (112) anzuzeigen, wobei diese Einrichtung (107, 108, 110) eine Bildverarbeitungseinrichtung (110) aufweist, um das zusammengesetzte Bild auf Grundlage der ausgewählten Kartendaten und der Positionsdaten des beweglichen Objekts zu erzeugen; und
- die Bildverarbeitungseinrichtung (110) bei jeder Positionsbestimmung durch die Positionsbestimmungseinrichtung (100) prüft, ob die bestimmte Position innerhalb eines Bereichs der Kartendaten liegt oder nicht, der zuvor vom Hauptsender (20) übertragen wurde.

2. Mobiles Navigationssystem nach Anspruch 1, ferner mit:

- einer am beweglichen Objekt (10) angebrachten Einrichtung (103 - 108), um die Positionsdaten und einen Kennungscode für das bewegliche Objekt (19) selbst zusammenzusetzen; und
- einer am beweglichen Objekt (10) angebrachten Einrichtung zum Aufteilen der vom Hauptsender gesendeten Daten in die Kartendaten und den Kennungscode.

3. Mobiles Navigationssystem nach Anspruch 2, ferner mit einer am beweglichen Objekt (10) angebrachten Einrichtung (108) zum Vergleichen des durch die Aufteilungseinrichtung abgetrennten

Kennungscode mit dem Kennungscode des beweglichen Objekts (10) selbst, um zu überprüfen, dass die gesendeten Kartendaten an das bewegliche Objekt (10) gerichtet sind.

4. Mobiles Navigationssystem nach Anspruch 1, das ferner eine im Hauptsender angebrachte Einrichtung (203) beinhaltet, um die vom beweglichen Objekt gesendeten Positionsdaten und den Kennungscode aufzuteilen, und um die von der Erzeugungseinrichtung erzeugten Kartendaten und den Kennungscode des beweglichen Objekts zusammenzusetzen.

5. Mobiles Navigationssystem nach Anspruch 1, bei dem der Hauptsender (20) eine Funkstation mit festem Ort ist.

6. Mobiles Navigationssystem nach Anspruch 1, bei dem die Bestimmungseinrichtung mehrere künstliche Satelliten (30a - 30d) und einen GPS-Empfänger (102) zum Erzeugen der Positionsdaten, wie sie für die Position des beweglichen Objekts (10) repräsentativ sind, unter Verwendung der von den Satelliten gesendeten Umlaufdaten, beinhaltet.

Revendications

1. Système de navigation mobile comprenant : au moins un objet mobile (10) ; un émetteur principal (20) ; un système de transmission conçu pour assurer la transmission entre ledit au moins un objet mobile (10) et ledit émetteur principal ; des moyens (100) pour déterminer la position dudit au moins un objet mobile ; une unité de base de données (206), montée dans l'émetteur principal, pour mémoriser des données cartographiques ; des moyens (205), montés dans l'émetteur principal, sensibles aux données de position reçues pour obtenir de l'unité de base de données des données cartographiques d'une zone comprenant la position reçue dudit au moins un objet mobile ; des moyens (202), montés dans l'émetteur principal pour émettre des données comprenant les données cartographiques obtenues vers ledit au moins un objet mobile par l'intermédiaire du système de transmission ; et des moyens (112), montés sur ledit au moins un objet mobile pour afficher une image composite composée des données de position de l'objet mobile et des données cartographiques, en réponse aux données émises à partir de l'émetteur principal ;
caractérisé en ce que

lesdits moyens de détermination de position (100) sont montés sur ledit au moins un objet mobile (10),
des moyens (105, 106) sont fournis, montés sur ledit au moins un objet mobile, pour émettre des données représentatives de la position déterminée vers l'émetteur principal par l'intermédiaire du système de transmission,
des moyens (107, 108, 110) sont fournis, montés sur ledit au moins un objet mobile, pour sélectionner les données cartographiques correspondant à sa position des informations émises par l'émetteur principal et afficher les données cartographiques sélectionnées sur ledit moyen d'affichage (112), et lesdits moyens (107, 108, 110) incluant des moyens de traitement d'image (110) pour former l'image composite basée sur les données cartographiques sélectionnées et sur les données de position de l'objet mobile, et
lesdits moyens de traitement d'image (110) vérifient, lors de chaque détermination de position desdits moyens de détermination de position (100), si oui ou non la position déterminée se situe à l'intérieur d'une zone des données cartographiques précédemment émises à partir de l'émetteur principal (20).

2. Système de navigation mobile, selon la revendication 1, dans lequel le système comprend en outre des moyens (103 à 108), montés sur l'objet mobile (10), pour composer les données de position et un code d'identification de l'objet mobile (10) lui-même ; et

des moyens, montés sur l'objet mobile (10), pour séparer les données émises à partir de l'émetteur principal en données cartographiques et code d'identification.

3. Système de navigation mobile selon la revendication 2, dans lequel le système comprend en outre des moyens (108), montés sur l'objet mobile (10), pour comparer le code d'identification séparé par lesdits moyens de séparation avec le code d'identification de l'objet mobile (10) lui-même pour vérifier que les données cartographiques émises sont dirigées vers ledit objet mobile (10).

4. Système de navigation mobile selon la revendication 1, dans lequel le système comprend en outre des moyens (203) montés dans l'émetteur principal pour séparer les données de position émises à partir de l'objet mobile et le code d'identification, et pour composer les données cartographiques obtenues des moyens de déduction et le code d'identification de l'objet mobile.

5. Système de navigation mobile selon la revendication 1, dans lequel ledit émetteur principal (20) est une station radio située à un emplacement fixe.

6. Système de navigation mobile selon la revendication 1, dans lequel lesdits moyens de détermination comprennent une pluralité de satellites artificiels (30a à 30d) et un récepteur GPS (102) pour produire les données de position représentatives de la position de l'objet mobile (10) en utilisant des données d'orbite émises depuis les satellites.

Fig. 1

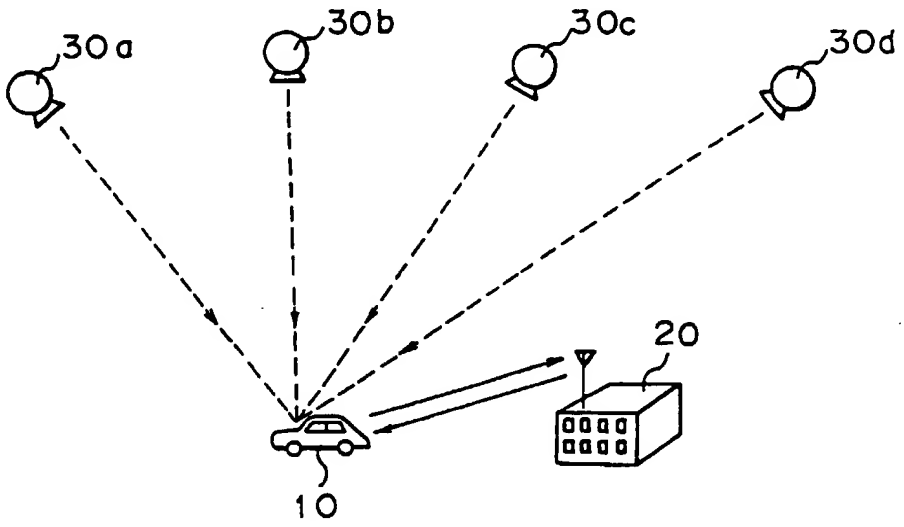


Fig. 4a

ID CODE	POSITION DATA

Fig. 4b

POSITION DATA	ID CODE

Fig. 2

Fig.2a	Fig. 2b

Fig. 2a

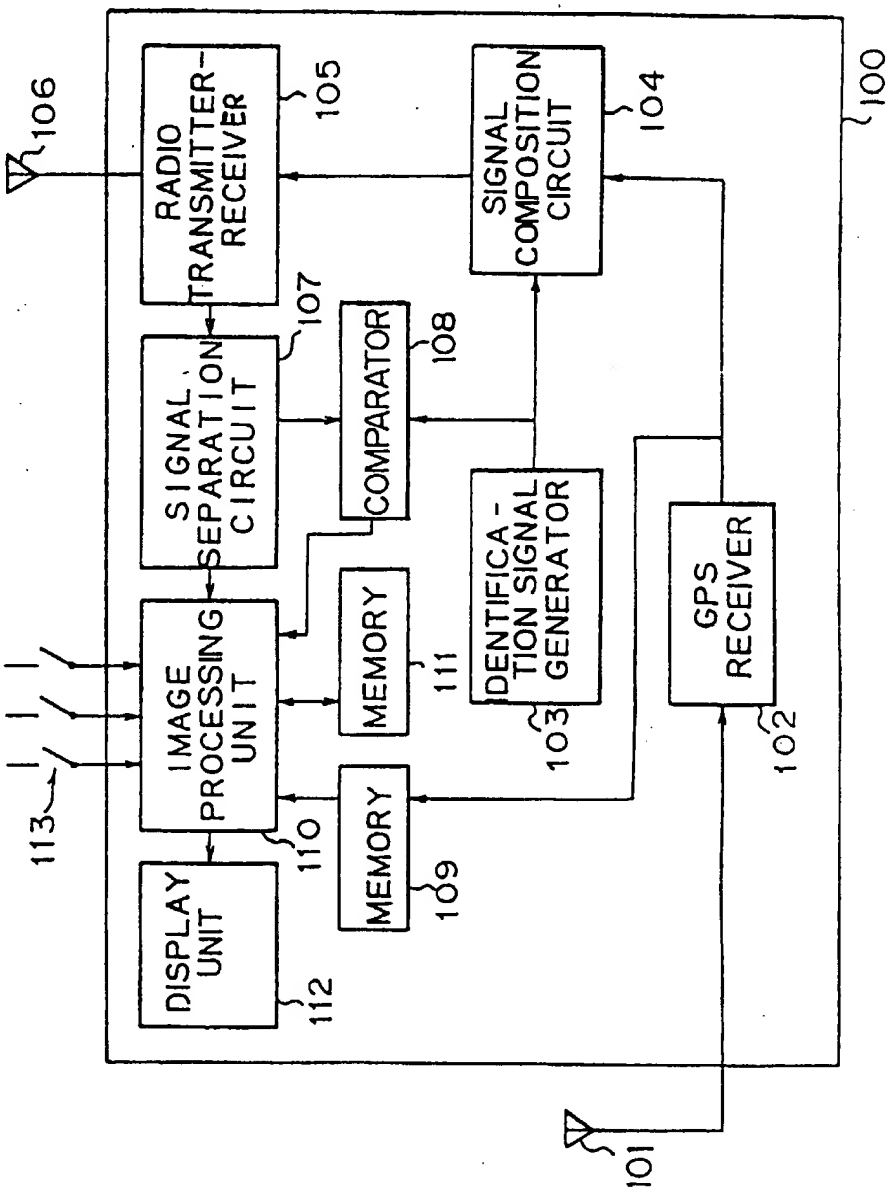


Fig. 2b

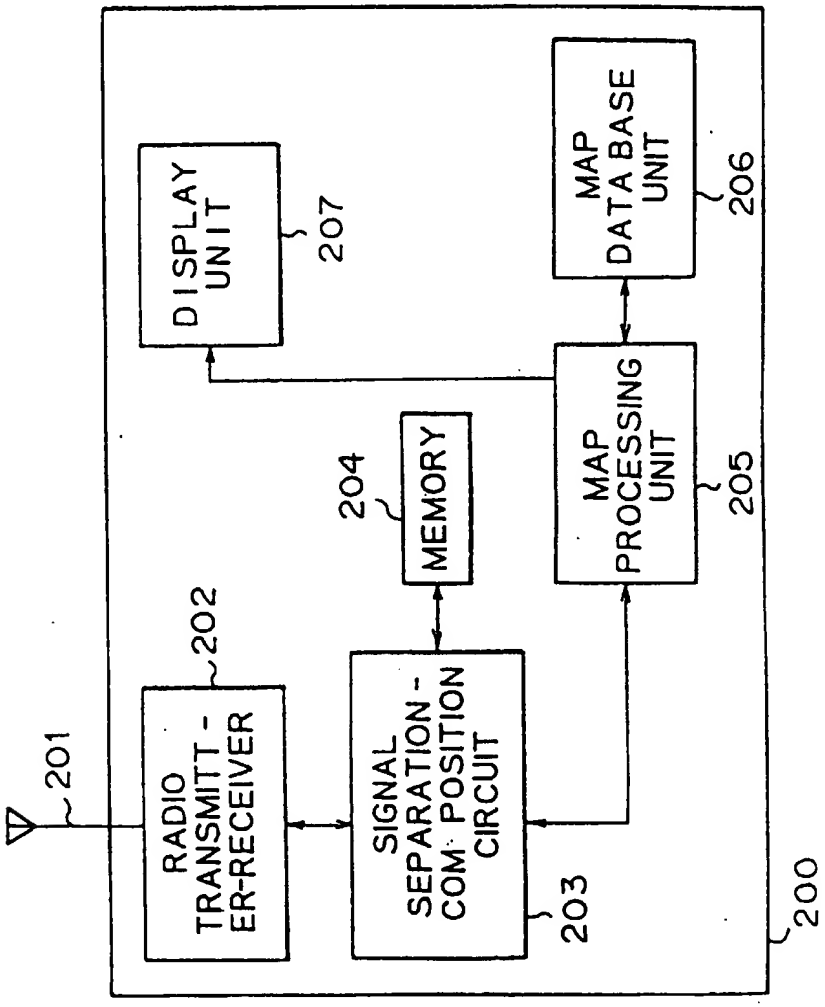

DISPLAY UNIT
207
MAP DATA BASE UNIT
206
MAP PROCESSING UNIT
205
204
MEMORY
202
RADIO TRANSMITT-ER-RECEIVER
201
SIGNAL SEPARATION-COM-POSITION CIRCUIT
203
200

Fig.3a

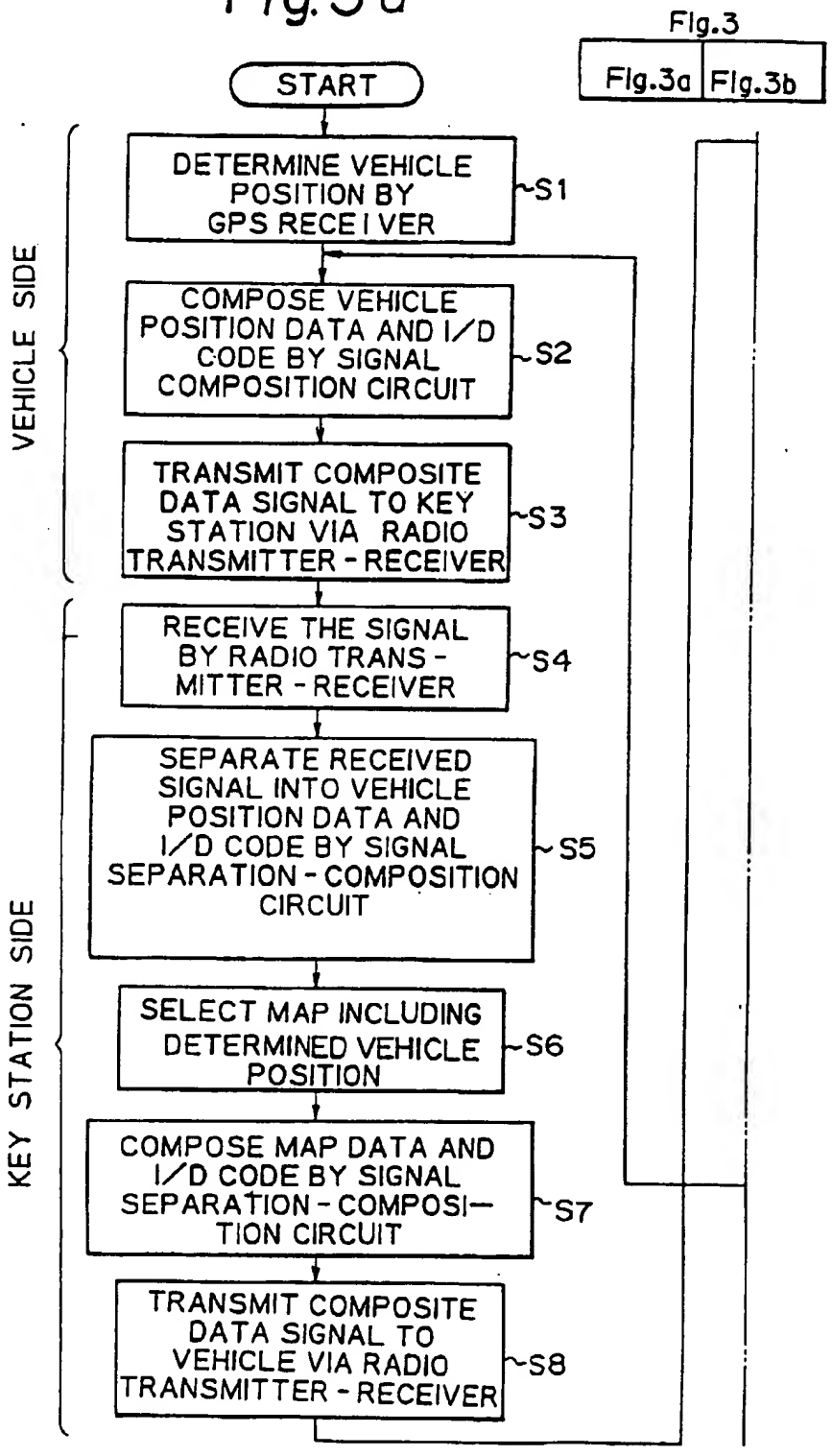
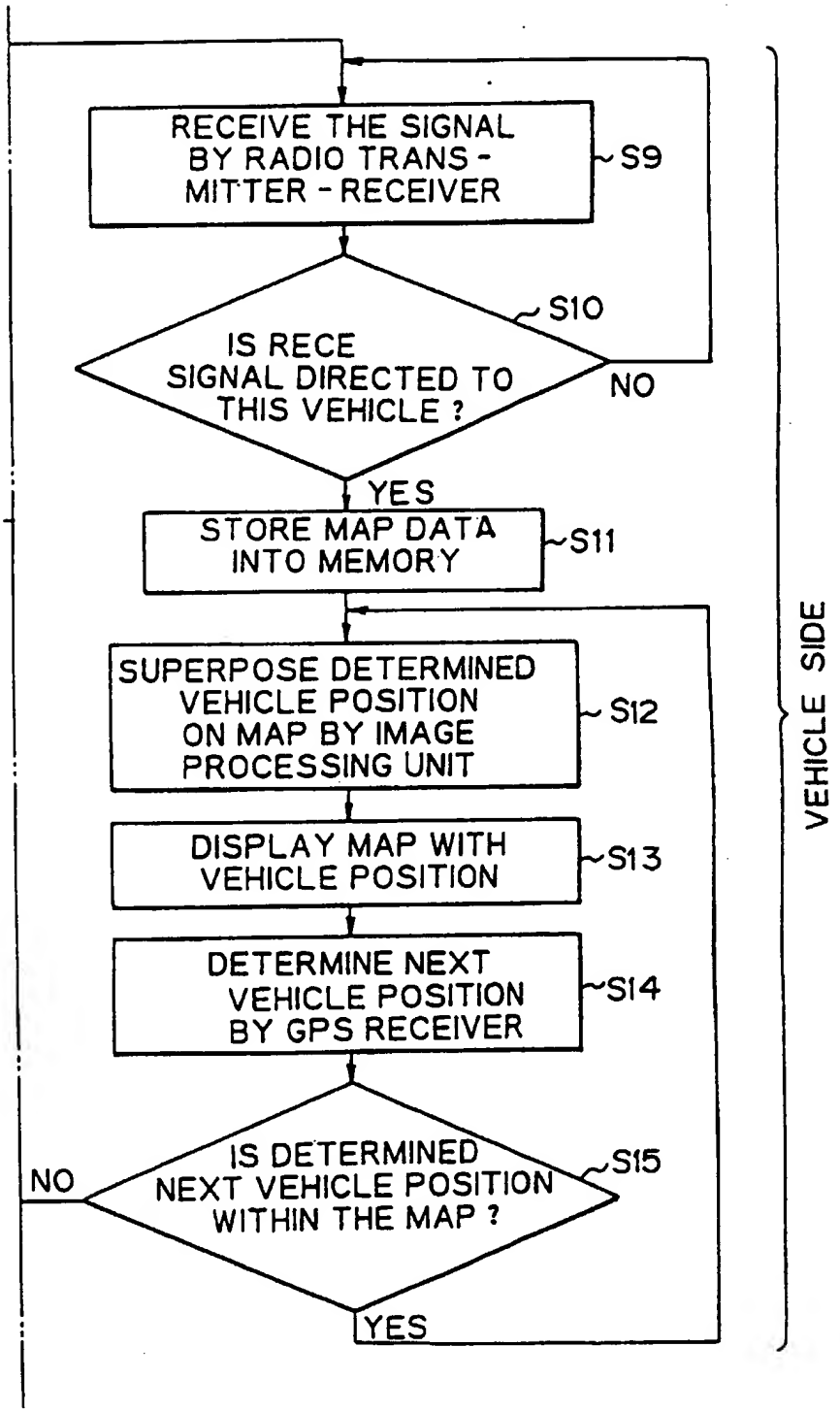


Fig.3
Fig.3a
Fig.3b
START
VEHICLE SIDE
DETERMINE VEHICLE POSITION BY GPS RECEIVER
S1
COMPOSE VEHICLE POSITION DATA AND I/D CODE BY SIGNAL COMPOSITION CIRCUIT
S2
TRANSMIT COMPOSITE DATA SIGNAL TO KEY STATION VIA RADIO TRANSMITTER - RECEIVER
S3
KEY STATION SIDE
RECEIVE THE SIGNAL BY RADIO TRANSMITTER - RECEIVER
S4
SEPARATE RECEIVED SIGNAL INTO VEHICLE POSITION DATA AND I/D CODE BY SIGNAL SEPARATION - COMPOSITION CIRCUIT
S5
SELECT MAP INCLUDING DETERMINED VEHICLE POSITION
S6
COMPOSE MAP DATA AND I/D CODE BY SIGNAL SEPARATION - COMPOSITION CIRCUIT
S7
TRANSMIT COMPOSITE DATA SIGNAL TO VEHICLE VIA RADIO TRANSMITTER - RECEIVER
S8

Fig.3b


RECEIVE THE SIGNAL BY RADIO TRANS - MITTER - RECEIVER
S9
IS RECE SIGNAL DIRECTED TO THIS VEHICLE ?
S10
NO
YES
STORE MAP DATA INTO MEMORY
S11
SUPERPOSE DETERMINED VEHICLE POSITION ON MAP BY IMAGE PROCESSING UNIT
S12
DISPLAY MAP WITH VEHICLE POSITION
S13
DETERMINE NEXT VEHICLE POSITION BY GPS RECEIVER
S14
IS DETERMINED NEXT VEHICLE POSITION WITHIN THE MAP ?
S15
NO
YES
VEHICLE SIDE